Serial No. 10/673,609                                    Docket No. ASA-901-02
Amendment
Response to Office Action mailed October 19, 2007

## REMARKS

**Pending Claims**

Claims 11-12, 14-17, 19-22 and 24-30 are pending in this application. Claims

11, 16, 21, 24 and 27 have been amended. No new matter has been added.


**Claim Rejections under 35 U.S.C. §103**

Claims 11-12, 14-17, 19-22 and 24-30 are rejected under 35 U.S.C. §103(a) as

being unpatentable over Milligan et al., U.S. Patent No. 5,210,866 (Milligan), and

further in view of Bachmat et al., U.S. Patent No. 6,237,063 (Bachmat). Applicants

request reconsideration of the rejections for the following reasons.

The invention is directed to data recovery in a computer system whereby a

backup copy of the data is stored to a tape at a certain point in time. Each of the

independent claims includes that the backup copy of the data is made at the certain

point in time. Further, each of independent claims 16, 21, 24 and 27 has been amended

to be consistent with independent claim 11 in setting forth that after the said certain

point in time, upon occurrence of a failure in a sequence of processing executed by said

host computer or when recovery of the data in the first logical volume to the certain

point in time becomes necessary, the second logical volume is selected, the backup

copy of the data made at the certain point in time is read from the tape and written to the

second logical volume. Then, the host instructs the controller to relate the second

logical volume in the second physical storage area to the first logical volume in the first

physical storage area according to a swap request by exchanging positional or mapping

information of the second logical volume with positional or mapping information of the

14

first logical volume (claims 11, 16 and 21), so that the controller accesses the second

physical storage area when the controller receives an access request to the first logical

volume from the host computer.

Thus the claims refer to, *inter alia*, storing a backup copy of data to tape at a

certain point in time in combination with reading the backup copy from the tape and

writing the backup copy to a second logical volume at a later point in time. That is, the

claims refer to the occurrence of a failure in a sequence of processing executed by the

host computer or the necessity of recovery of the data in the first logical volume to the

certain point in time, which events occur after the certain point in time. On the other

hand, Milligan discloses a different sequence of events. First, in Milligan, the

occurrence of a failed disk drive occurs. Then, a new disk drive is put into service and

a copy of the data of the failed disk drive is made. See col. 3, lines 43-48 of Milligan,

which states:

> In addition, a pool of R globally switchable spare disk drives is maintained in
> the data storage subsystem to automatically substitute a replacement disk drive
> for a disk drive in any redundancy group that fails during operation. The pool of
> R spare disk drives provides high system reliability at low cost.

See also col. 3, lines 57-66 of Milligan, which states:

> Once a failed disk drive in a redundancy group is identified, a backup disk drive
> from the shared pool of spare disk drives is automatically switched in place of
> the failed disk drive. Control circuitry reconstructs the data stored on each
> physical track of the failed disk drive, using the remaining N-1 physical tracks
> of data plus the associated M physical tracks containing redundancy segments
> of each logical track. A failure in the redundancy segments does not require data
> reconstruction, but necessitates regeneration of the redundancy information.
> The reconstructed data is then written onto the substitute disk drive. The use of
> spare disk drives increases the system reliability of the N+M parallel disk drive
> architecture while the use of a shared pool of spare disk drives minimizes the
> cost of providing the improved reliability.

15

Accordingly, Milligan does not disclose the claimed combination of storing a backup

copy of data to tape at a certain point in time with reading the backup copy from the

tape and writing the backup copy to a second logical volume at a later point in time, as

included in the claimed combination, which further includes that the host instructs the

controller to relate the second logical volume in the second physical storage area to the

first logical volume in the first physical storage area according to a swap request by

exchanging positional or mapping information of the second logical volume with

positional or mapping information of the first logical volume, so that the controller

accesses the second physical storage area when the controller receives an access request

to the first logical volume from the host computer.

Applicants recognize that Milligan also discloses making a backup copy at a

certain point in time, by copying data to a tape drive, for example. However, the

backup copy is not used to reconstruct a failed disk drive as alleged in the Office Action.

Each of the citations to Milligan in the Office Action discuss either making a backup

copy to a tape drive or other medium; or reconstructing data of a failed and replaced

disk drive using the data of the redundancy group. In Milligan, there is no disclosure of

using the backup copy to write the data of the backup copy to a logical volume in the

event or occurrence of a failure in a sequence of processing, as in the present invention.

As previously stated on the record, in the present invention, data of a logical

volume at a certain point in time is able to be recovered from a backup copy of the

logical volume stored on a tape. When a failure occurs in a sequence of processing,

under Applicants' invention, data of the first volume may be restored to a past point in

time. It follows that the processing may then be restarted at that point in time.

16

Accordingly, when it is necessary to restore the first volume to a past point in time, the host selects an unused second volume made up of a second physical storage area, and copies the backup copy of the data from the tape to the second volume to create a backup copy of the first volume at the certain point in time. The host then issues a swap instruction that instructs the storage system to exchange positional information for the first volume with the second volume, so that access requests to the first volume are directed to the second volume and/or the second physical storage area. Thus, unlike Milligan, Applicants' invention does not require the use of a substitute disk drive, and Applicants' invention does not relate to reconstructing current data using redundancy information. Instead, Applicants' invention is directed to restoring data in a volume to a specified point in time by swapping positional or mapping information with a restored backup volume, which is neither taught nor suggested by Milligan, Bachmat, or the other art of record.

Bachmat is cited in combination with Milligan for teaching exchangeable logical volumes and mirroring, in general. As set forth above, Milligan teaches nothing regarding restoring data from a tape to an unused volume in the storage system, and Bachmat does not make up for this deficiency. Accordingly, claims 11-12, 14-17, 19-22 and 24-30 are allowable over the teachings of Milligan and Bachmat and the other art of record, whether taken singly, or in combination. Therefore, the rejection under 35 U.S.C. §103(a) should be withdrawn.

17

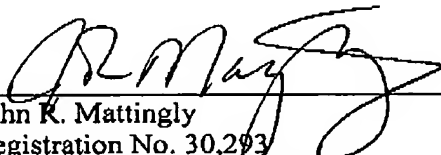Serial No. 10/673,609                                    Docket No. ASA-901-02
Amendment
Response to Office Action mailed October 19, 2007

## Conclusion

In view of the foregoing, Applicant respectfully requests that a timely Notice of

Allowance be issued in this case.

Respectfully submitted,

Mattingly, Stanger, Malur & Brundidge, P.C.

John K. Mattingly
Registration No. 30,293
Telephone:  (703) 684-1120

Date:  January 22, 2008

18